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SDK60 Quick Start Guide

For Board Revision 3

UG005 v1.2 – March 18, 2009

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Table of Contents

Preface ---- **iv**
About this Guide ---- iv
What is Needed ---- iv
Reference Documents ---- iv
Conventions Used in this Guide ---- v

Chapter 1 – SDK60 Demonstration Board ---- **1**
Overview ---- 1
Features ---- 1
Off-Chip Memory ---- 1
SerDes Interfaces ---- 1
Other High-Speed Data Interfaces ---- 1
Extensions to Enable use of Off-the-Shelf Cards ---- 1
Other Headers (Extensions) ---- 1
Control and Status ---- 2
Clocks ---- 2
SDK60 Board ---- 2

Chapter 2 – Getting Started ---- **5**
Installing Software and Drivers ---- 5
Set Up the Board ---- 5
Bringing Up the Board ---- 8
Install the Achronix Demo Interface (ADI) Software ---- 9
Connecting to the ADI Software ---- 11

Chapter 3 – Troubleshooting ---- **13**
Resolving Serial Connectivity Issues ---- 13

Revision History ---- **15**

Preface

About this Guide

This guide provides the new user details of setting up the Achronix SDK60 demonstration board.

This guide consists of three chapters:

- **Chapter 1 – "SDK60 Demonstration Board"** provides an overview of the demonstration board.
- **Chapter 2 – "Getting Started"** gives step-by-step instructions for setting up the board.
- **Chapter 3 – "Troubleshooting"** covers resolving issues related to the SDK60 board and AXE demonstration software.

What is Needed

- SDK60 Demonstration Board.
- PC running Windows XP with serial port.
- Bitporter pod, USB cable and EJTAG cable (all included with the Bitporter pod).
- Serial cable (supplied)
- Power supply (supplied)

Reference Documents

ACE User Guide (UG001)

ACE Installation and Licensing Guide (UG002)

ACE Quick Start Guide (UG003)

Bitporter User Guide (UG004)

SDK60 User Guide (UG007)

Conventions Used in this Guide

Item	Format	Examples
Command-line entries	Formatted with the Courier bold font face.	`$ Open top_level_name.log`
File Names	Formatted with the Courier font face.	`filename.ext`
GUI buttons, menus and radio buttons	Formatted with the Helvetica bold font face.	Click **OK** to continue. **File → Open**
Variables	Formatted with italic emphasis.	*design_dir*`/output.log`
Window and dialog box headings and sub-headings	Heading formatted in quotation marks.	Under "Output Files," select ...
Window and dialog box names	Initial caps.	From the Add Files dialog box, ...

Chapter 1 – SDK60 Demonstration Board

Overview

The Achronix Speedster Development Kit for the SPD60 (SDK60) delivers a practical platform for designers to evaluate Speedster FPGA performance and IP. The board (**Figure 1-1**) allows designers to evaluate the high-performance Speedster features at speed, including logic, RAMs, multipliers, SerDes, programmable I/Os and Achronix patented picoPIPE™ acceleration technology.

The board can operate stand-alone or as a PCI Express plug-in card and features a rich selection of on-board memories and data interfaces. The kit comes complete with development tools and a collection of standard reference designs (see **"SDK60 Board"**).

Features

Off-Chip Memory

- DDR2 (128M × 72)
- DDR3 (128M × 8)
- RLDRAM (16M × 18)
- QDRII+ (4M × 18)

SerDes Interfaces

- Direct SerDes access (SMA connectors)
- x8 PCI Express socket connector
- x1 PCI Express socket connector
- 10 Gigabit Ethernet (XAUI module)
- Gigabit Ethernet (SGMII)
- Small Form-Factor (SFF) optical transceiver modules

Other High-Speed Data Interfaces

- Three 96-pin high-speed extension headers for daughter cards such as video (HDMI/DVI) and signal processing (ADC/DAC)

Extensions to Enable use of Off-the-Shelf Cards

- Advanced Mezzanine Card (AMC) connector
- PCI Mezzanine Card (PMC) connector

Other Headers (Extensions)

- Mictor 32-pin header, and three 6-pin headers

Control and Status

- DIP and pushbutton switches
- LEDs

Clocks

- On-board crystals and oscillators
- Connectors for external clock signals
- Clock Generators (to derive clocks from fundamental frequencies).
- Device Configuration Options
- IEEE 1149.1 JTAG
- SPI Flash
- CPU

SDK60 Board

Figure 1-1 provides an annotated graphic of the SDK60 board with annotations for the key components referred to in this guide. These components are described in **Table 1-1**.

Table 1-1: *SDK60 Key Components*

Designator	Name	Description
DS15	User LED	Controlled via SPD60
DS16	User LED	Controlled via SPD60
J12	AMC connector	Advanced Mezzanine Card interface
J41	Power supply connector	Main power connector
J49	JTAG connector	JTAG cable connector for Bitporter
J76	LCD connector	Connector for output to LCD display module.
J82	Fan power	Heatsink fan power supply.
J83	PCIe x1	Socket connector for PCIe x1 interface.
J84	PCIe x8	Socket connector for PCIe x8 interface
J86	RS232 Mode	Sets the mode for the RS-232 connection at P1
JN1	PMC connectors	PCI Mezzanine Card interface
JN2		
JN3		
P1	RS-232 DB-9 connector	RS-232 interface
S4	User pushbutton	Input to SPD60
S5	User pushbutton	Input to SPD60
S6	User pushbutton	Input to SPD60
S7	User pushbutton	Input to SPD60
U2	QDRII+ SRAM	P/N CY7C1563V18
U3	RLDRAM	P/N MT49H16M18
U10	DDR2 SDRAM	P/N MT41J128M8
U11	SOCDIMM socket	DDR2/QDR2 200-pin SODIMM socket

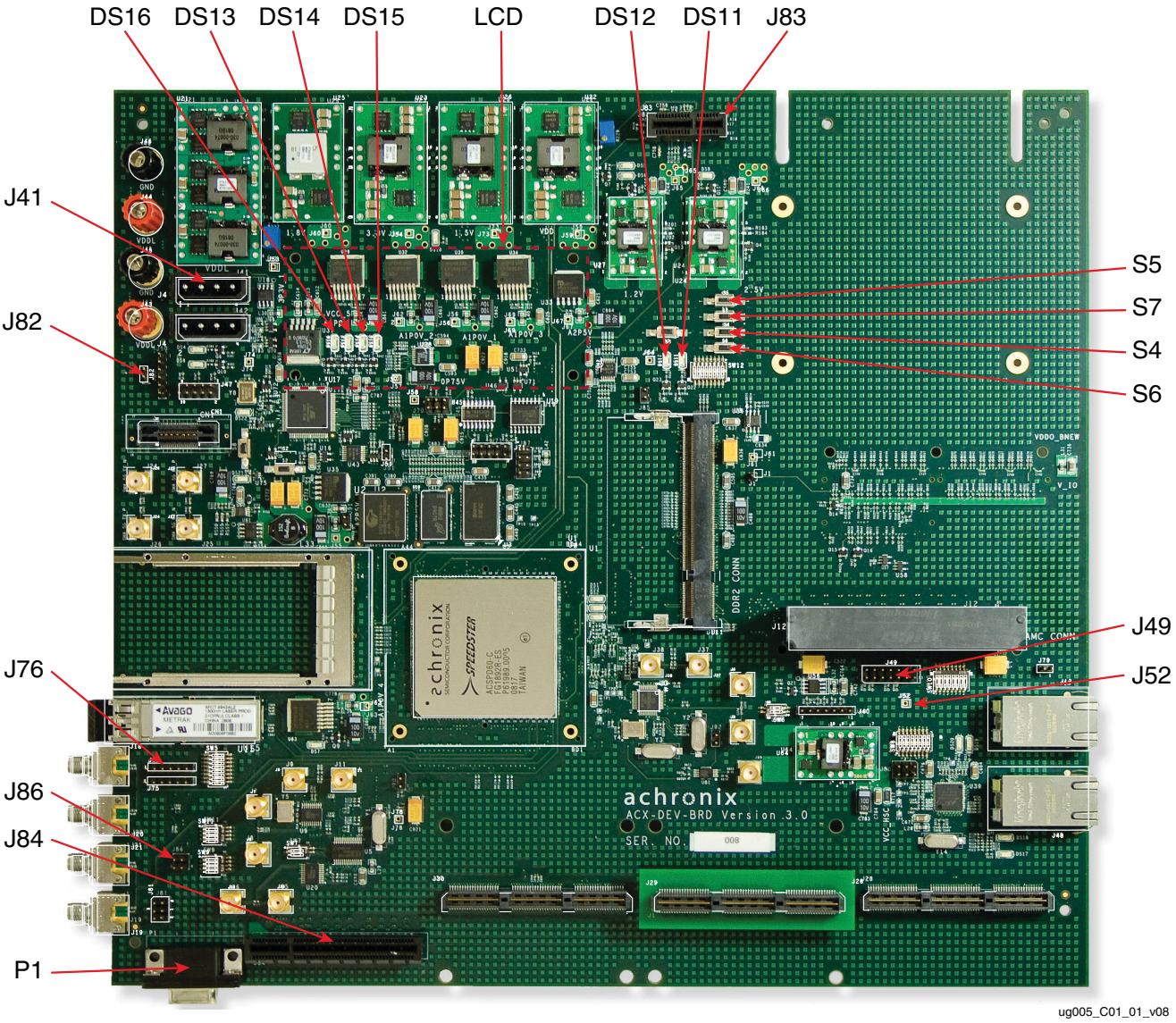


Figure 1-1: *SDK60 Development Board (Shown Without LCD Display Installed)*

Chapter 2 – Getting Started

This chapter provides step-by-step instructions for setting up the SDK60 demonstration board.

Installing Software and Drivers

Prior to setting up the board, either Achronix CAD Environment (ACE) or the standalone STAPL player and USB drivers need to be installed. Refer to the *ACE Installation and Licensing Guide* (UG002) for ACE installation or to the *Bitporter User Guide* (UG004) for standalone STAPL player and USB driver installation.

Set Up the Board

1. Connect the power supply cable to the power supply connector (J41).

   Important! *Do not power the board at this time.*

2. Connect the supplied serial cable to connector P1 on the SDK60. Connect the other end to the host PC.
3. Connect one end of the JTAG cable to the Bitporter pod and the other to the JTAG connector (J49). Both ends of the cable are identical.

   Note: *The key of the JTAG cable should point towards J52 (towards the bottom edge of the board) and the red strip towards the FPGA.*

4. Connect one end of the USB cable to the Bitporter and the other to the host PC. If the Bitporter drivers are already installed on the host system, skip to **"Bringing Up the Board,"** on page 8.
5. When prompted by the Found New Hardware Wizard, select **Yes, this time only** and click **Next >** (**Figure 2-1**).

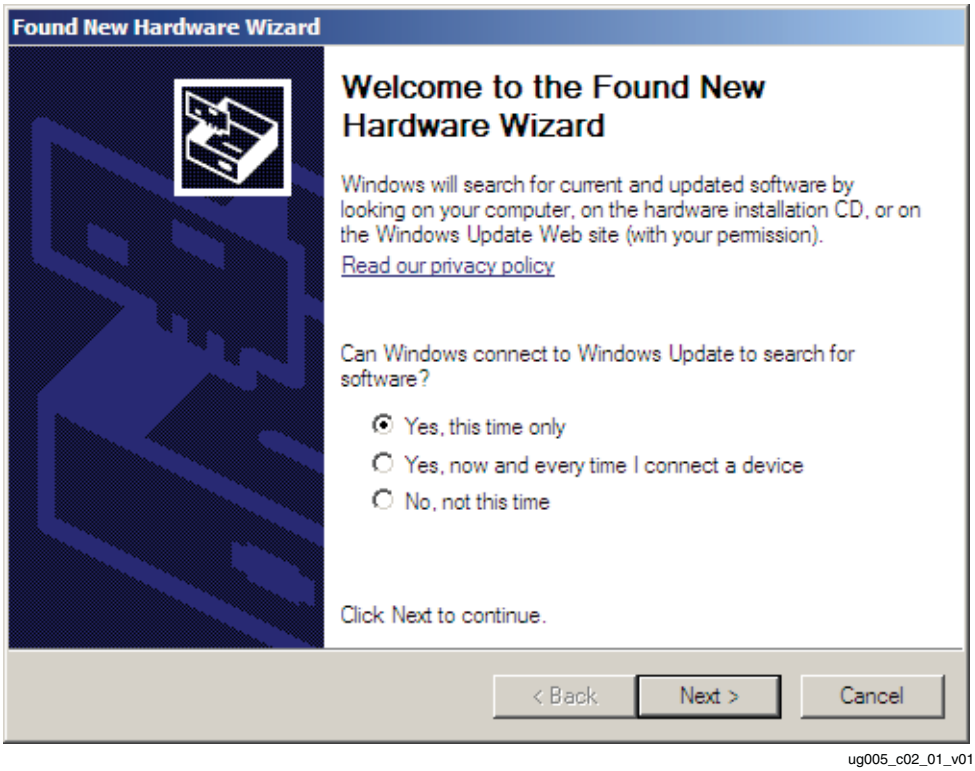


Figure 2-1: *Found New Hardware Wizard*

6. At the next window of the wizard (**Figure 2-2**), select **Install the software automatically (Recommended)**, followed by **Next >.**

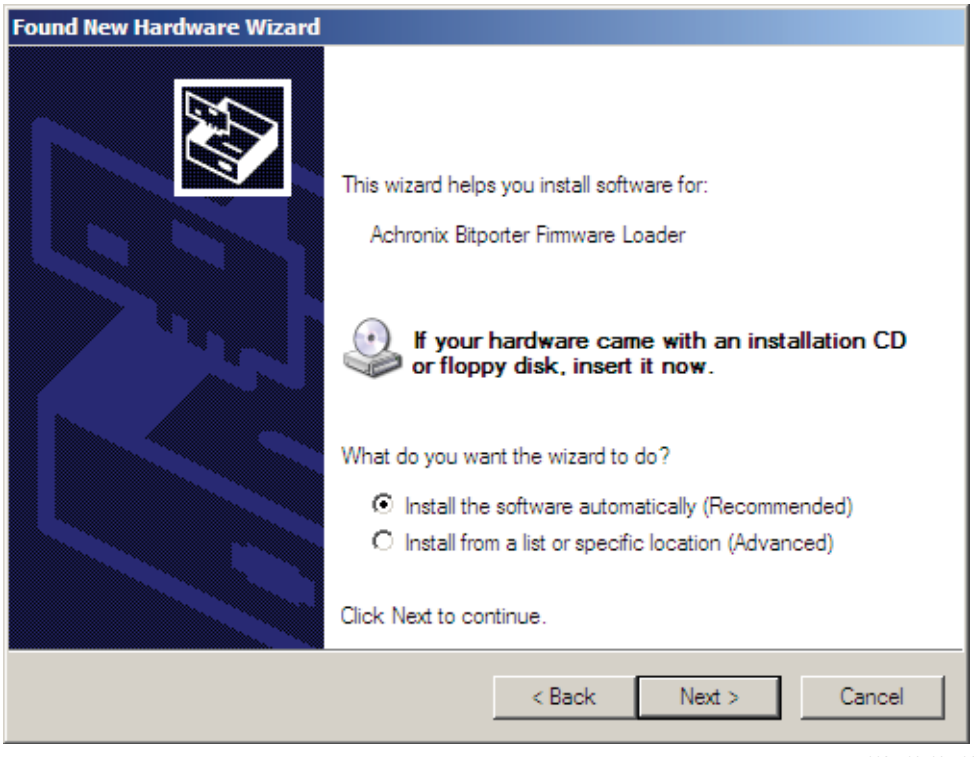
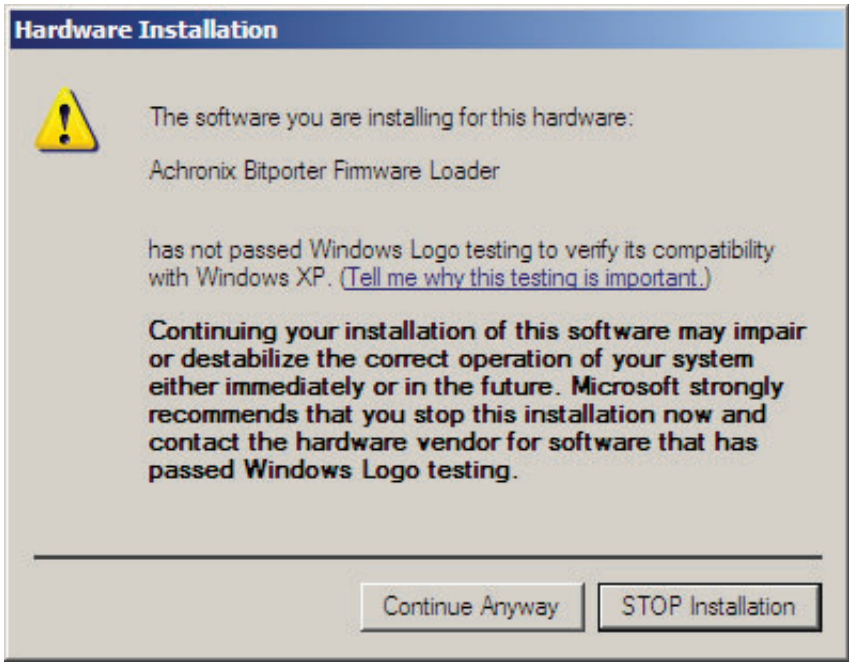


Figure 2-2: *Found New Hardware Wizard*

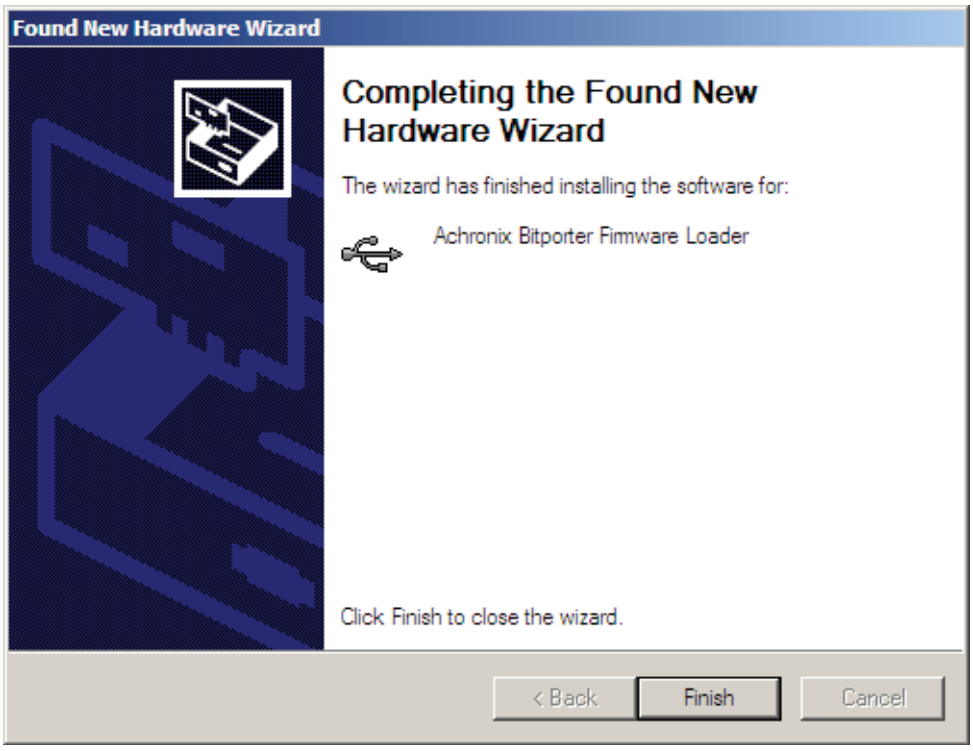
7. After the wizard has found the Bitporter firmware loader, the Windows Logo testing warning window, click **Continue Anyway**.



ug005_c02_03_v01

Figure 2-3: *Windows Logo Testing Warning Window*

8. At the final wizard window (**Figure 2-4**), click Finish to complete the driver install and restart the system (if requested).



ug005_c02_04_v01

Figure 2-4: *Completing the Found New Hardware Wizard*

The wizard appears twice during the install: once for the Achronix Bitporter Firmware Loader and then again for the Achronix Bitporter Probe drivers. The first driver downloads firmware to the Bitporter pod; the second driver connects to the probe for JTAG operations.

If *not* prompted to install these drivers the first time the Bitporter is connected to a USB port, unplug the USB cable, reboot the host PC. Once the system has rebooted, plug in the USB cable again — at this point driver installation should begin.

Note: *During the driver installation, the Bitporter pod's power LED turns on and the COMM LED may flash. Once driver installation completes successfully, the power LED remains lit, and the COMM LED turns off.*

Bringing Up the Board

Important! *Before powering up the board, ensure that the pre-installed heatsink has not been damaged during shipping and securely rests over the FPGA. Also ensure that the heatsink fan power connector is in place. The heatsink fan electrical connector should be attached to the provided receptacle labeled J82 with the red wire facing the red power jack (J43). Finally ensure that the 6-pin LCD cable is connected to J2 of the 16 × 2 character display, with the other end connected to J76.*

Power up the board:

1. Turn the power supply on. Several LEDs on the board light, indicating active power. If a bitstream exists in the on-board flash device, the FPGA is configured and the configuration status LED (DS12) lights. Otherwise, DS12 remains unlit.

Program the on-board Speedster FPGA to verify the set-up:

2. Copy the demonstration bitstreams (`demo_0.jam`, `demo_1.jam`, and `demo_2.jam`) from the directory `/Demos` on the SDK60 CD to the host system.
3. Open a command prompt on the host system (**Start** → **Run**, then enter **CMD**, and click **OK**; or **Start** → **All Programs** (or **Programs**) → **Accessories** → **Command Prompt**).
4. Locate the directory on the host system containing the demonstration bitstreams, and then download the demo_0 bitstream to the FPGA. From a command prompt:

   ```
   acx_stapl_player -aprogram demo_0.jam
   ```

   Note: *The STAPL player* `acx_stapl_player.exe` *is typically located under the directory:*

   ```
   \Program Files\Achronix CAD Environment\Achronix\system\cmd
   ```

   The configuration status LED (DS12) lights, indicating the start of configuration. Once the bitstream is downloaded, the configuration done LED (DS11) lights indicating the successful device configuration. In addition, `acx_stapl_player` returns:

   ```
   Exiting JTAG programming mode...
   Exit code = 0... Success
   ```

   The demo 0 bitstream allows the user to light the LEDs DS13 to DS16 via switches S4 to S7. **Table 2-1** list which switch controls which LED.

Table 2-1: *Demo 0 Functionality*

Pushbutton Switch	Function
S4	Lights LED DS16.
S5	Lights LED DS13.
S6	Lights LED DS14.
S7	Lights LED DS15.

5. To try the 16 × 2 character LCD, locate `demo_1.jam`, and then download the demo_1 bitstream to the FPGA. From a command prompt:

   ```
   acx_stapl_player -aprogram demo_1.jam
   ```

   Again, the configuration status LED (DS12) lights, indicating the start of configuration. Once the bitstream has downloaded, the configuration done LED (DS11) lights to indicate the device has been successfully configured.

   The demo 1 bitstream allows the user to verify communication with the LCD. Pressing Reset (S4) displays the following message:

   ```
   SPD60 EVAL BOARD
   DEMO:BUILD-1
   ```

   Table 2-2 describes demo 1 functionality.

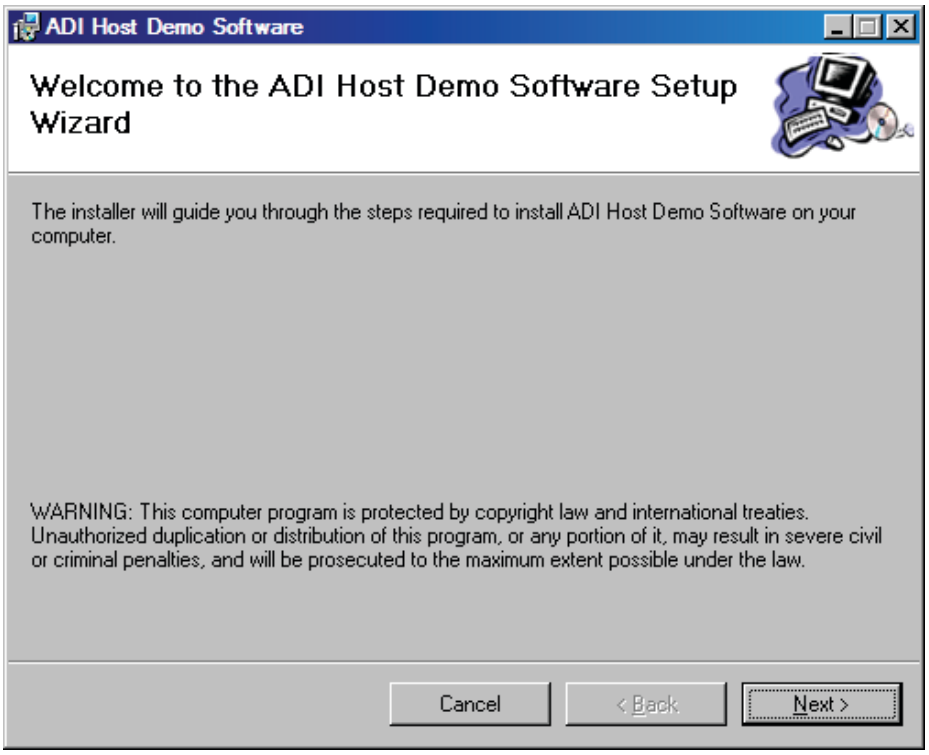
   Board set-up and check out is complete.

Table 2-2: *Demo 1 Functionality*

DIP Switch	Function	
	LEDs	LCD Displays
S4 (Reset)	All LEDs off.	`SPD60 EVAL BOARD` `DEMO:BUILD-1`
S5	Lights LED DS13.	`SW5 was pressed` `DS13 is glowing`
S6	Lights LED DS14.	`SW6 was pressed` `DS14 is glowing`
S7	Lights LED DS15.	`SW7 was pressed` `DS15 is glowing`

Install the Achronix Demo Interface (ADI) Software

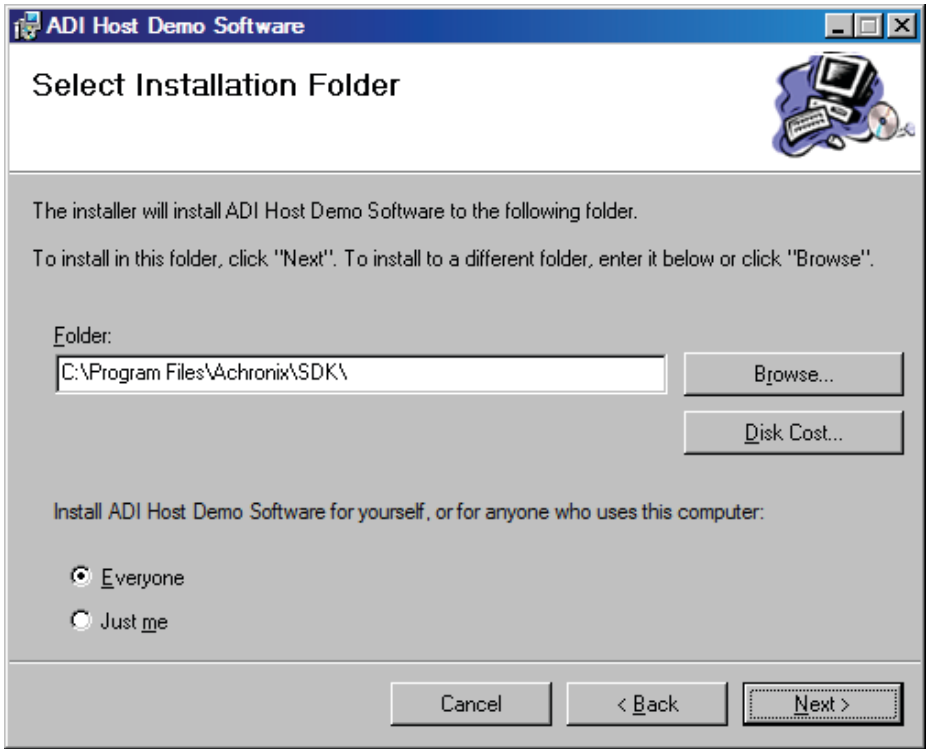
1. Navigate to the `\Software` directory on the SDK60 CD, and double-click the installer (`setup.exe`) to begin the software install.
2. ADI Software wizard (**Figure 2-5**), click **Next >**.



ug005_c02_07_v02

Figure 2-5: *ADI Software Wizard*

3. Select the install folder from the Select Installation Folder Window (**Figure 2-6**) and click **Next >**.



ug005_c02_10_v01

Figure 2-6: *Select Installation Folder Window*

4. From the Confirm Installation window, click **Next >**. Software installation begins, including placing an icon on the host system desktop. Upon completion, click **Close** to complete the process.

Connecting to the ADI Software

1. Locate `demo_2.jam`, and then download the demo_2 bitstream to the FPGA. From a command prompt:

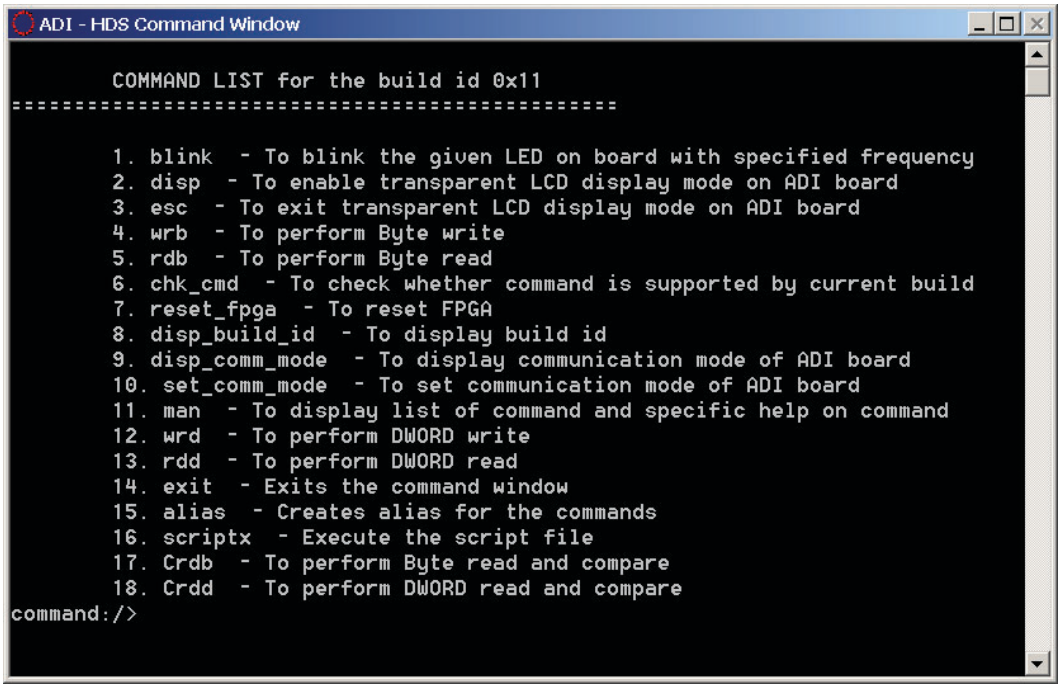
   ```
   acx_stapl_player -aprogram demo_2.jam
   ```

   Once the bitstream is downloaded, demo 2 displays the same functionality on the board as demo 1, except pressing Reset (S4) displays the following message:

   ```
   SPD60 EVAL BOARD
   DEMO:BUILD-2
   ```

2. Select **Start** → **All Programs** (or **Programs**) → **Achronix** → **GUI_HDS** (or double-click the desktop icon) to launch the software. The program start and checks for serial connectivity to the board.

   Two windows open: a command interface window (**Figure 2-7**), and the main ADI software window.



ug005_c02_08_v03

Figure 2-7: *HDS Command Window*

If the program fails to connect to the board/FPGA at the default port (COM1), an error pop-up appears (**Figure 2-8**). Click **OK** for the program to attempt to auto detect. If the SDK60 board connect error pop-up appears, refer to **"Resolving Serial Connectivity Issues" in Chapter 3 – Troubleshooting.**

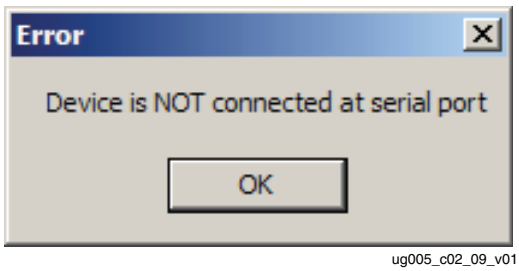


Figure 2-8: *Error Pop-Up*

3. To verify communication with the board and the FPGA, write data to the LCD display (at address `0x100`):

   ```
   wrd 0x100 30313233
   ```

   The command window returns:

   ```
   reading status register....
   the command is executed successfully
   ```

   And the first four places of the first line of the display show:

   ```
   0123
   ```

4. To read data from the same location:

   ```
   rdd 0X100
   ```

   The command window returns:

   ```
   reading status register....Done.
   reading data register....
   Address 0x100 => Value 30313233
   ```

5. Select **File** → **Exit** to close GUI_HDS.

The board and software have been correctly set up and configured.

Chapter 3 – Troubleshooting

Resolving Serial Connectivity Issues

If the ADI board connect error pop-up appears (**Figure 3-1**), try manually setting the serial connection to resolve the issue:



Figure 3-1: *ADI Board Connect Error Pop-Up*

1. At the ADI board connect error pop-up, click OK to open the Select Communication Mode window (**Figure 3-2**). Verify that the settings are correct for the host machine, the cable is properly connected, and click **Connect**. If the connection still fails, close GUI_HDS (**File** → **Exit**) and proceed to **Step 2**.

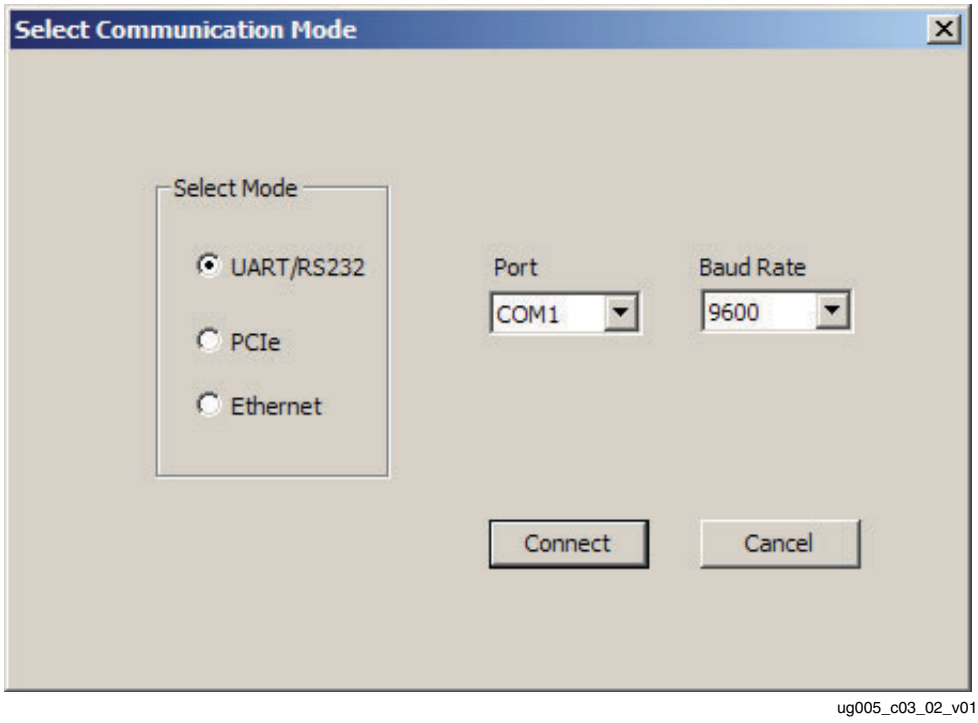
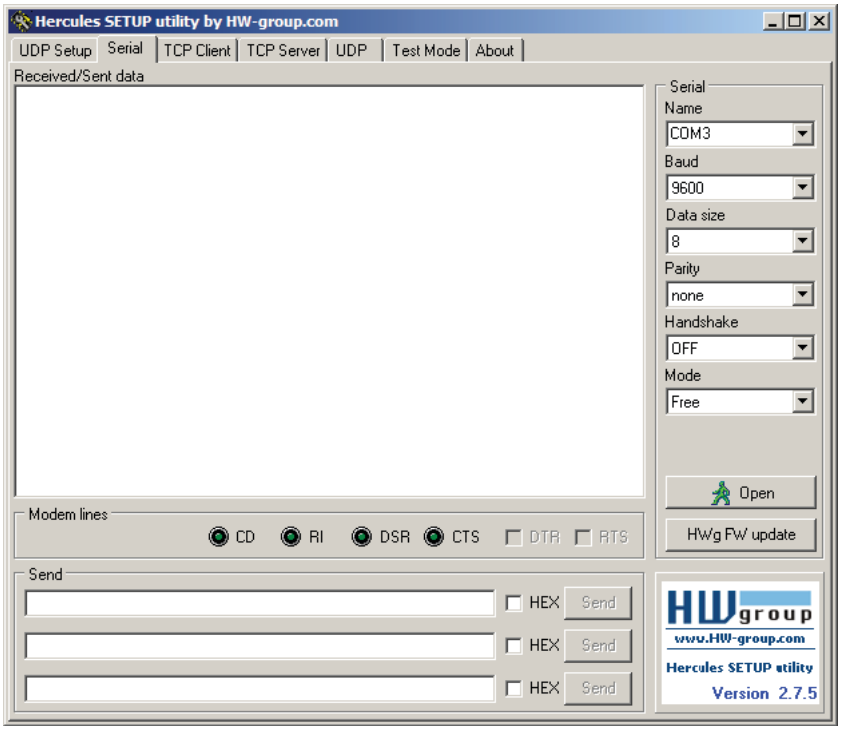


Figure 3-2: *Select Communication Mode Window*

2. To manually configure the serial port of the host machine, locate the `\Software` directory on the SDK60 CD. Start the Hercules SETUP utility (`HerculesSetup.exe`). Click **Close** to close the license screen and proceed to the main program window. Click the **Serial** tab to access the serial port setup (**Figure 3-3**).



ug005_c03_03_v01

Figure 3-3: *Hercules Setup Utility*

3. Within the command window under "Received/Sent data" right-click → **Special chars** → **Hexadecimal** followed by right-click → **Hex** mode to enable hexidecimal mode. Click **Open** to activate the port. The program returns:

```
COM1 opened
```

4. Close the program and restart GUI_HDS. If the program still fails to connect, contact Achronix Technical Support at support@achronix.com.

Revision History

The following table lists the revision history of this document.

Version	Revision
1.0	Initial release version.
1.1	Updated to support revision 3 of SDK60.
1.2	• Updated to revision 3 of SDK60 with LCD display installed. • Updated for version 1.6.2 of ADI Host Demo Software.

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